



Designation: D 4110 – 9502

## Standard Performance Specification for Men's and Boys' Knitted Bathrobe, Dressing Gown, and Pajama Fabrics<sup>1</sup>

This standard is issued under the fixed designation D 4110; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This performance specification covers knitted fabrics for men's and boys' bathrobes, dressing gowns, and pajamas.

1.2 These performance requirements apply to the length and width directions for those properties where fabric direction is pertinent.

1.3 The following precautionary caveat pertains only to the test methods portion, Section 7, of this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

2.1 *ASTM Standards:*

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<sup>1</sup> This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.561 on Performance Standards for Textile Fabrics—Apparel.

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- D 123 Terminology Relating to Textiles<sup>2</sup>
- D 2594 Test Methods for Stretch Properties of Knitted Fabrics Having Low Power<sup>2</sup>
- D 2724 Test Methods for Bonded, Fused, and Laminated Apparel Fabrics<sup>2</sup>
- D 3786 Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics—Diaphragm Bursting Strength Tester Method<sup>3</sup>
- D 3787 Test Method for Bursting Strength of Knitted Goods—Constant-Rate-of-Traversal (CRT) Ball Burst Test<sup>3</sup>
- 2.2 *AATCC Methods*:<sup>4</sup>
  - 8 Colorfastness to Crocking: AATCC Crockmeter Method
  - 15 Colorfastness to Perspiration
  - 16 Colorfastness to Light
  - 23 Colorfastness to Burnt Gas Fumes
  - 61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated
  - 116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
  - 124 Appearance of Durable Press Fabrics After Repeated Home Launderings
  - 132 Colorfastness to Drycleaning
  - 135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics
  - 172 Colorfastness to Non-chlorine Bleach in Home Laundering
  - 188 Colorfastness to Sodium Hypochlorite Bleach in Home Laundering
- Evaluation Procedure No. 1 Gray Scale for Color Change
- Evaluation Procedure No. 2 Gray Scale for Staining
- Evaluation Procedure No. 3 AATCC Chromatic Transference Scale
- 2.3 *Federal Standard*:<sup>5</sup>
  - 16 CFR, Chapter II—Consumer Product Safety Commission Subchapter D—Flammable Fabrics Act Regulations
- 2.4 *Military Standard*:<sup>6</sup>
  - MIL-STD-105D Sampling Procedures and Tables for Inspection by Attributes

NOTE 1—Reference to test methods in this standard give only the permanent part of the designation of ASTM, AATCC, or other test methods. The current edition of each test method cited shall prevail.

### 3. Terminology

#### 3.1 Definitions:

3.2 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Terminology D 123.

3.3 Definitions found in a dictionary of common terms are suitable for terms used in this specification.

### 4. Specification Requirements

4.1 The properties of knitted fabrics for bathrobes, dressing gowns, and pajamas shall conform to the specification requirements in Table 1.

### 5. Significance and Use

5.1 Upon agreement between the purchaser and the seller, knitted fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

5.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

5.2.1 In such cases, any references to the specification shall specify that: “This fabric meets ASTM Specification D 4110 except for the following characteristic(s).”

5.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 5.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

5.4 The significance and use of particular properties and methods are discussed in the appropriate sections of the specified test methods.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 07.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 07.02.

<sup>4</sup> Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709.

<sup>5</sup> Available from Superintendent of Documents, Government Printing Office, Washington, DC 20402.

<sup>6</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

**TABLE 1 Specification Requirements**

NOTE 1—Class for color change, color transfer, and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

Characteristic	Requirements	Section
<i>Bursting strength(load)(ball burst)</i>	222 N (50 lbf), min	7.1
<i>Dimensional change:</i>		
Pressing and finishing	2 % max	7.2.1
After five launderings	5 % max	7.2.2
After three drycleanings	2 % max	7.2.3
Growth	3 % max	7.2.4
<i>Colorfastness:</i>		
Burnt gas fumes—2 cycles:		7.3.1
Shade change, original fabric	Class 4 <sup>A</sup> min	
Shade change after one laundering or one drycleaning	Class 4 <sup>A</sup> min	
Sodium Hypochlorite Bleach	Class 4 <sup>A</sup> min	7.3.7
Non-Chlorine Bleach	Class 4 <sup>A</sup> min	7.3.8
Laundering:		7.3.2
Shade change	Class 4 <sup>A</sup> min	
Staining	Class 3 <sup>B</sup> min	
Drycleaning:		7.3.3
Shade change	Class 4 <sup>A</sup> min	
Crocking:		7.3.4
Wet	Class 4 <sup>C</sup> min	
Dry	Class 3 <sup>C</sup> min	
Perspiration:		7.3.5
Shade change	Class 4 <sup>A</sup> min	
Staining	Class 3 <sup>B</sup> min	
Light (20 AATCC FU) (xenon-arc)	Step 4 <sup>A</sup> min	7.3.6
<i>Fabric appearance</i> (see 7.4.1.1)	DP 3.5 <sup>D</sup> min	7.4
<i>Flammability</i>	pass	7.5

<sup>A</sup> AATCC Gray Scale for Color Change.

<sup>B</sup> AATCC Gray Scale for Staining.

<sup>C</sup> AATCC Chromatic Transference Scale.

<sup>D</sup> For durable press fabrics only.

## 6. Sampling

6.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of rolls as directed in an applicable specification or other agreement between the purchaser and the supplier, such as an agreement to use MIL-STD-105D.

6.2 *Laboratory Sample*—From each roll or piece in the lot sample, cut two laboratory samples the full width of the fabric and at least 375 mm (15 in.) along the selvage.

## 7. Test Methods (See Note 1)

7.1 *Bursting Strength*—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Test Methods D 3786 or D 3787.

NOTE 2—There is no overall correlation between the results obtained when using the constant-rate-of-traverse (CRT) machine equipped with a bursting attachment and the diaphragm-bursting tester. Consequently, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting-attachment method shall prevail.

NOTE 3—The precision of the ball-burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm-bursting tester method are being established by Subcommittee D 13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

### 7.2 Dimensional Change:

7.2.1 *Pressing and Finishing During Garment Manufacturing*—Mark specimen(s) as directed in 4.5 of AATCC Method 135. Press and finish specimen(s) as agreed upon between the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135 (see Note 4).

7.2.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press according to the cycle in 10.1.4 through 10.1.4.5 of Test Methods D 2724.

NOTE 4—No method is available for reproducing on a laboratory level the results of industrial press or finish treatments, or both, used in the

manufacture of knitted bathrobes, dressing gowns, and pajamas.<sup>7</sup>

**7.2.2 Laundering**—Determine the maximum dimensional change after five launderings or as agreed upon between the purchaser and the seller as directed in the applicable procedure in AATCC Test Methods 135 (Notes 5 and 6).

7.2.2.1 The wash conditions and drying procedure shall be as specified by the seller.

**7.2.3 Drycleaning**— Determine the maximum-dimensional change after three drycleanings or as agreed upon between the purchaser and the seller in accordance with 10.1.1 through 10.1.5 of Test Methods D 2724 (Notes 5 and 6).

7.2.4 **Growth**—Determine the growth of the fabric as directed in Test Methods D 2594.

NOTE 5—Launderable fabrics are expected to be dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish that is soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. “Dry-cleanable” goods are to be drycleaned only.

NOTE 6—Specimens prepared for 7.2.1 may be used for 7.2.2-7.2.3 as desired. When this is done, the dimensional change due to laundering or drycleaning is calculated using Eq 1. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 6.1).

$$\text{Percent Dimensional Change} = 100 (D_1 - D_2)/D_2 \quad (1)$$

where:

$D_1$  = measurement after laundering or drycleaning, and

$D_2$  = measurement after pressing and finishing.

**7.3 Colorfastness:**

**7.3.1 Burnt Gas Fumes**— Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23 after 2 cycles.

NOTE 7—Washing conditions shall be the same as those used in 7.2.2.1. Drycleaning conditions shall be the same as those used in 7.2.3.

**7.3.2 Laundering**—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61. The test conditions shall be as specified by the seller (Note 5).

7.3.3 **Drycleaning**— Determine colorfastness to drycleaning as directed in AATCC Method 132 (Note 5).

**7.3.4 Crocking**—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8 for solid shades and AATCC Method 116 for prints, or as agreed upon between the purchaser and the seller.

7.3.5 **Perspiration**— Determine colorfastness to perspiration as directed in AATCC Method 15.

7.3.6 **Light**—Determine colorfastness to light as directed in AATCC Method 16.

NOTE 8—There are distinct differences in spectral distribution between the various types of machines listed in AATCC Method 16, with no overall correlations between them. Consequently, these machines cannot be used interchangeably. In case of controversy, results obtained with the Water Cooled Xenon Arc machine listed in Option E shall prevail.

**7.3.7 Colorfastness to Sodium Hypochlorite Bleach**—Determine colorfastness to sodium hypochlorite bleach as directed in AATCC Test Method 188.

**7.3.8 Non-chlorine Bleach**—Determine colorfastness to non-chlorine bleach as directed in AATCC Test Method 172

**7.4 Fabric Appearance**—Determine the fabric appearance as directed in AATCC Method 124 after laundering using the wash-and-wear cycle or the normal cycle as agreed upon between the purchaser and seller, as specified in 7.2.2.1 for washable fabrics or as specified in 7.2.3 for dry-cleanable fabrics (see Note 5).

7.4.1 For fabrics not intended for use in durable-press garments, determine the fabric smoothness after pressing as specified in 10.2.5 of Test Methods D 2724.

7.4.1.1 The fabric smoothness or durable press (DP) rating of such fabrics, and the DP rating of dry-cleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

**7.5 Flammability**— The flammability requirements shall be as agreed upon between the purchaser and the seller, provided they meet or exceed those of Part 1610 of the Flammable Fabrics Act Regulations.

7.5.1 When the fabrics covered in this performance specification are used or intended to be used to make children’s sleepwear garments, they must meet or exceed the requirements set forth in Part 161 5 (sizes 0 through 6X), or Part 161 6 (sizes 7 through 14) of the Flammable Fabrics Act.

## 8. Keywords

8.1 bathrobe; pajama

<sup>7</sup> The development of a method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

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